AMENDMENTS TO THE CLAIMS

Applicant has submitted a new complete claim set showing marked up claims with insertions indicated by underlining and deletions indicated by strikeouts and/or double bracketing.

1. (Currently amended) A catheter comprising:

a catheter shaft having a distal end, the distal end of the catheter shaft having an insulating material and a diameter; and

an ablation electrode forming a junction with the distal end of the shaft, the ablation electrode having an exposed surface;

wherein, extending from the junction, the exposed electrode surface has a first diameter portion with a first diameter that is smaller than the diameter of the distal end of the shaft, the first diameter portion forming an angle with the insulating material; and

wherein the exposed electrode surface has a second diameter portion with a second diameter that is larger than the first diameter of the first diameter portion, the second diameter portion having a largest diameter that is smaller than a length of the second diameter portion; and

wherein the exposed electrode surface further comprises a transition face extending from the first diameter portion to the second diameter portion, the transition face forming an approximately ninety degree angle with the first diameter portion; and

wherein the insulating material, the first diameter portion and the transition face form a recessed region that allows blood to flow across the first diameter portion and the transition face when the electrode is placed in a blood flow.

2-3. (Canceled)

4. (Original) The catheter according to claim 1, wherein the ablation electrode further comprises a plurality of recessed regions that allow blood to flow across exposed surfaces of the recessed regions when the electrode is placed in a blood flow.

5. (Original) The catheter according to claim 1, wherein the ablation electrode is a distal tip ablation electrode.

6. (Previously presented) The catheter according to claim 35, wherein the ablation electrode is a ring ablation electrode.

7. (Previously presented) The catheter according to claim 1, wherein the transition face forms an approximately ninety degree angle with the exposed surface of the second diameter portion.

8. (Currently amended) The catheter according to claim 1, wherein the distance from the insulating material to the transition face along the first diameter portion is ~~larger than~~ at least 0.3 millimeters.

9. (Original) The catheter according to claim 1, wherein the distance from the insulating material to the transition face along the first diameter portion is less than the diameter of the first diameter portion.

10. (Original) The catheter according to claim 1, wherein the distance from the insulating material to the transition face along the first diameter portion is approximately 0.9 millimeters.

11. (Original) The catheter according to claim 1, wherein the transition face extends at least 0.3 millimeters toward a center longitudinal axis of the electrode from the exposed surface of the electrode.

12. (Currently amended) The catheter according to claim [[3]] 1, wherein the recessed region encircles the ablation electrode.

13. (Original) The catheter according to claim 1, wherein a largest diameter of the electrode is no larger than a diameter of the insulating material forming the first sidewall.

14. (Original) The catheter according to claim 1, wherein the transition face is parallel to a distal end of the catheter shaft.

15 (Previously presented) The catheter according to claim 1, wherein the first diameter portion and the insulating material form an angle of approximately ninety degrees.

16. (Previously presented) The catheter according to claim 1, wherein the first diameter portion and the insulating material form an angle of more than ninety degrees.

17. (Previously presented) The catheter according to claim 1, wherein the first diameter portion and the insulating material form an angle less than ninety degrees.

18. (Original) The catheter according to claim 1, wherein the ablation electrode is approximately four millimeters in length.

19. (Currently amended) A catheter comprising:

a shaft including an electrically insulating material; and

an ablation electrode forming a junction with the insulating material and having an exposed surface that forms a channel with the insulating material, the insulating material having a diameter at the junction;

wherein:

a base of the channel comprises a first diameter portion of the exposed electrode surface, and the first diameter portion has a diameter that is smaller than the diameter of the insulating material at the junction;

a first sidewall of the channel comprises the insulating material at the junction;

a second sidewall of the channel comprises a transition face between the first diameter portion and a second diameter portion of the electrode;

the exposed electrode surface of the first diameter portion is parallel to the second diameter portion of the electrode; and

a length of the second diameter portion of the electrode is greater than a diameter of the second diameter portion; and

the channel is sized to allow blood to flow across the channel base and the second sidewall when the electrode is placed in a blood flow.

20. (Original) The catheter according to claim 19, wherein the second sidewall forms an angle of less than 120 degrees with the channel base.

22. (Original) The catheter according to claim 19, wherein the ablation electrode further comprises a plurality of channels that allow blood to flow across exposed surfaces of the channels when the electrode is placed in a blood flow.

23. (Original) The catheter according to claim 19, wherein the ablation electrode is a distal tip ablation electrode.

24. (Original) The catheter according to claim 19, wherein the ablation electrode is a ring ablation electrode.

25. (Previously presented) The catheter according to claim 19, wherein the second sidewall forms an approximately ninety degree angle with the channel base.

26. (Currently amended) The catheter according to claim 19, wherein the distance from the first sidewall to the second sidewall along the base is ~~more than~~ at least 0.3 millimeters.

27. (Original) The catheter according to claim 19, wherein the distance from the first sidewall to the second sidewall along the base is less than a diameter of the first diameter portion.

28. (Original) The catheter according to claim 19, wherein the second sidewall extends at least 0.3 millimeters toward a center longitudinal axis of the electrode from an outer surface of the electrode.

29. (Original) The catheter according to claim 19, wherein the channel encircles the ablation electrode.

30. (Original) The catheter according to claim 19, wherein a largest diameter of the electrode is no larger than a diameter of the insulating material forming the first sidewall.

31. (Original) The catheter according to claim 19, wherein the ablation electrode is approximately four millimeters in length.

32. (Currently amended) A catheter comprising:

a catheter having an insulating sheath; and

an ablation electrode non-moveably attached to the insulating sheath, forming a junction with an end of the insulating sheath, and forming a channel with the end of insulating sheath;

wherein:

the end of the insulating sheath has a diameter;

a base of the channel comprises an exposed electrode surface of the ablation electrode, and a diameter of the ablation electrode along the channel base is smaller than the diameter of the end of the insulating sheath;

a first sidewall of the channel comprises the end of the insulating sheath, and the channel base intersects the end of the insulating sheath;

a second sidewall of the channel comprises an exposed electrode surface which extends from

the channel base to a portion of the ablation electrode which has a diameter that is larger than the diameter of the channel base portion;

the channel base is parallel to the larger diameter portion of the electrode; and

a width of the base of channel is at least one-tenth of the size of the largest diameter of the electrode and less than the smallest diameter of the electrode.

33. (Original) The catheter according to claim 32, wherein the electrode is a distal tip electrode.

34. (Original) The catheter according to claim 32, wherein the electrode is a ring electrode.

35. (Currently amended) A method of manufacturing a catheter tip, comprising:

providing a catheter shaft with an insulating sheath;

providing an ablation electrode having a first diameter portion with an exposed surface, a second diameter portion with an exposed surface, a transition face between the first and second diameter portions, and the second diameter portion having a length that is larger than a largest diameter of the second diameter portion; and

attaching the electrode to the shaft such that:

the first diameter portion of the electrode forms a junction with the insulating sheath ~~shaft~~, and the first diameter portion has a diameter that is smaller than a diameter of the insulating sheath at the junction of the electrode and the shaft;

each of the transition face and the sheath forms a sidewall of a channel and the first diameter portion of the electrode forms a base of the channel;

the insulating sheath, the first diameter portion and the transition face form a recessed region that is sized to allow blood to flow across the first diameter portion and the transition face when the electrode is placed in a blood flow; and

the transition face forms an approximately ninety degree angle with the channel base.

36. (Original) The method according to claim 35, wherein attaching the electrode to the shaft results in the base of channel being at least 0.9 millimeters wide from sidewall to sidewall.

37. (New) The catheter according to claim 1, further comprising an abrupt change in electrical properties at the junction of the ablation electrode and the distal end of the shaft.

38. (New) The catheter according to claim 19, further comprising an abrupt change in electrical properties at the junction formed by the ablation electrode with the insulating material.

39. (New) The catheter according to claim 32, further comprising an abrupt change in electrical properties at the junction formed by the ablation electrode with the insulating material.

40. (New) The method according to claim 35, wherein attaching the electrode to the shaft comprises forming an abrupt change in electrical properties at the junction of the electrode with the insulating sheath.